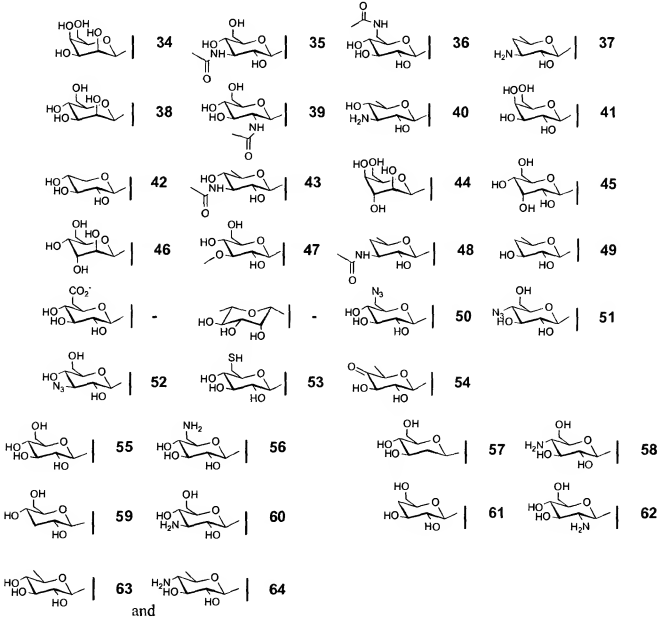
CLAIMS

What is claimed:

1. A method comprising incubating at least one moiety capable of being glycosylated and at least one thymidine or uridine nucleotide diphosphosugar comprising a sugar structure selected from the group consisting of:



and

in the presence of at least one first glycosyltransferase wherein at least one glycosylated compound is produced.

2. A method according to claim 1, wherein the incubation is carried out in vitro.

3. A method according to claim 1, wherein more than one nucleotide diphosphosugar is incubated with at least one moiety capable of being glycosylated in the presence of at least one first glycosyltransferase.

4. A method according to claim 1, further wherein the moiety capable of being glycosylated is selected from the group consisting of natural and synthetic metabolites, pyran rings, furan rings, enediynes, anthracyclines, angucyclines, aureolic acids, orthosomycins, macrolides, aminoglycosides, non-ribosomal peptides, polyenes, steroids, lipids, indolocarbazoles, bleomycins, amicetins, benzoisochromanequinones coumarins, polyketides, pluramycins, aminoglycosides, oligosaccharides, peptides, proteins, hybrids consisting of one or more these components, analogs and bioactive aglycons thereof

5. A method of claim 1, further wherein the moiety capable of being glycosylated is selected from the group consisting of vancomycin, teicoplannin, analogs, hybrids, and active aglycons thereof.

6. A method of claim 1, further wherein at least one of the at least one first glycosyltransferase is selected from the group consisting of CalB, CalE, CalN, CalU, Gra orfl4, Gra orf5, LanGT1, LanGT2, LanGT3, LanGT4, MtmGI, MtmGII, MtmGTIII, MtmGTIV, NovM, RhlB, Rif orf 7, SnogD, SnogE, SnogZ, UrdGT1a, UrdGT1b,

UrdGT1c, UrdGT2, AknK, AknS, DesVII, DnrS, OleG1, OleG2, TylCV, TylMII, TylN, DauH, DnrH, EryBV, EryCIII, Ngt, BgtA, BgtB, BgtC, GftA, GftB, GftC, GftD, GftE, Gpl-1, Gpl-2, RtfA, AveBI, BlmE, BlmF, MgtA, NysD1, OleD, OleI, SpcF, SpcG, StrH, Ugt51B1, Ugt51C1, UGT52, UgtA, UgtB, UgtC, UgtD and homologs thereof.

7. A method according to claim 1, wherein at least one of the at least one first glycosyltransferase is GftE.

8. A method according to claim 1, further comprising incubating the at least one glycosylated compound with at least one second nucleotide diphosphosugar in the presence of at least one second glycosyltransferase to produce at least one twice-glycosylated compound having at least a first and a second glycosyl attachment.

9. A method according to claim 8, wherein at least one of the at least one second glycosyltransferase is GftD.

10. A method of claim 8, further wherein the first and second glycosyl attachments are the same.

11. A method of claim 8, further wherein the first and second glycosyl attachments are different.

12. A method of claim 8, further wherein the both the first and the second glycosyl attachments are attached to the moiety capable of being glycosylated.

13. A method of claim 8, further wherein the second glycosyl attachment is attached to the first glycosyl attachment.

14. A method of claim 8, further wherein the first and second glycosyl transferases are the same.

15. A method of claim 8, further wherein the first and second glycosyl transferases are different.

16. A method according to claim 8, further comprising subjecting the at least one glycosylated compound to repeated cycles of incubation with at least one nucleotide diphosphosugar in the presence of at least one glycosyltransferase until a population multiply-glycosylated compounds of the desired type and number of compounds is achieved.

17. A compound produced by the method of any of claims 1, 8 or 16.

18. A method comprising incubating at least one moiety capable of being glycosylated and at least one thymidine or uridine nucleotide diphosphosugar comprising a sugar structure selected from the group consisting of: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in the presence of at least one first glycosyltransferase, wherein at least one glycosylated compound is produced.

19. A method according to claim 18, further wherein the moiety capable of being glycosylated is selected from the group consisting of natural and synthetic metabolites, pyran rings, furan rings, enediynes, anthracyclines, angucyclines, aureolic acids, orthosomycins, macrolides, aminoglycosides, non-ribosomal peptides, polyenes, steroids, lipids, indolocarbazoles, bleomycins, amicetins, benzoisochromanequinones coumarins, polyketides, pluramycins, aminoglycosides, oligosaccharides, peptides, proteins, hybrids consisting of one or more these components, analogs and bioactive aglycons thereof.

20. A method of claim 18, further wherein the moiety capable of being glycosylated is selected from the group consisting of vancomycin, teicoplannin, analogs, hybrids, and active aglycons thereof.

21. A method of claim 18, further wherein more than one moiety capable of being glycosylated is incubated with the at least one nucleotide diphosphosugar in the presence of the at least one first glycosyltransferase.

22. A method of claim 18, further wherein at least one of the at least one first glycosyltransferase is selected from the group consisting of CalB, CalE, CalN, CalU, Gra orf14, Gra orf5, LanGT1, LanGT2, LanGT3, LanGT4, MtmGI, MtmGII, MtmGTIII, MtmGTIV, NovM, RhlB, Rif orf 7, SnogD, SnogE, SnogZ, UrdGT1a, UrdGT1b, UrdGT1c, UrdGT2, AknK, AknS, DesVII, DnrS, OleG1, OleG2, TylCV, TylMII, TylN, DauH, DnrH, EryBV, EryCIII, Ngt, BgtA, BgtB, BgtC, GftA, GftB, GftC, GftD, GftE, Gp1-1, Gp1-2, RtfA, AveBI, BlmE, BlmF, MgtA, NysD1, OleD, OleI, SpcF, SpcG, StrH, Ugt51B1, Ugt51C1, UGT52, UgtA, UgtB, UgtC, UgtD and homologs thereof.

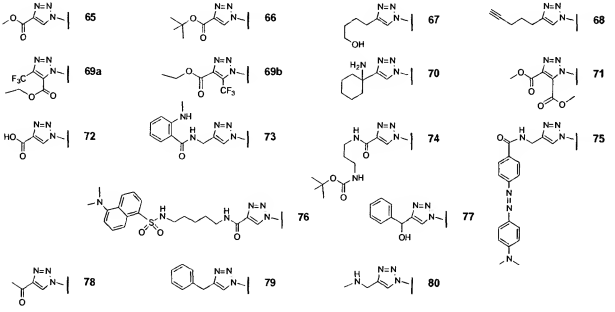
23. A method according to claim 18, further comprising incubating the at least one glycosylated compound with at least one second nucleotide diphosphosugar in the presence of at least one second glycosyltransferase to produce at least one twice-glycosylated compound having at least a first and a second glycosyl attachment.

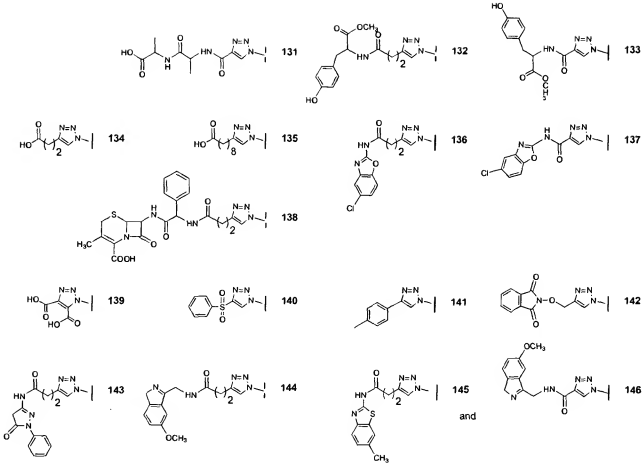
24. A method of claim 18, further wherein at least one of the at least one first glycosyltransferase is produced by expressing the product of a putative or known glycosyltransferase gene.

25. A method comprising subjecting at least one glycosylated compound produced according to the method of claim 18 to repeated cycles of incubation with at least one nucleotide diphosphosugar in the presence of at least one glycosyltransferase until a population of multiply-glycosylated compounds of the desired type and number of compounds is achieved.

26. A novel compound produced by the method of any of claims 18, 23 or 25.

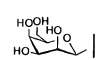
27. A method comprising incubating at least one chemoselectively ligatable moiety comprising a structure selected from the group consisting of:





and at least one glycosylated compound wherein at least one chemoselectively ligated compound is produced.

28. A method according to claim 27, further, wherein the glycosylated compound is initially produced by incubating at least one moiety capable of being glycosylated and at least one thymidine or uridine nucleotide diphosphosugar comprising a sugar structure selected from the group consisting of: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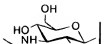
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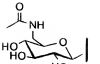
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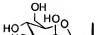
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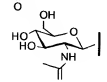
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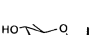
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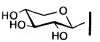
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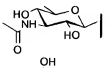
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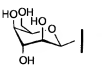
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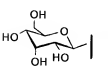
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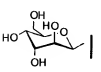
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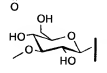
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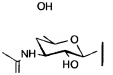
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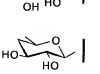
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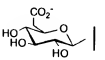
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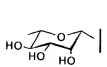
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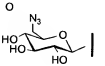
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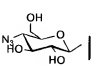
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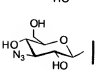
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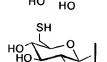
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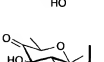
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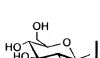
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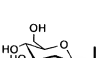
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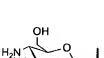
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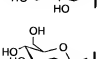
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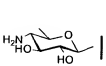
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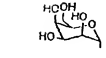
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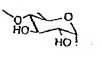
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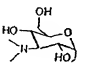
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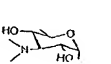
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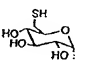
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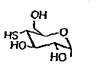
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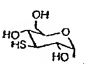
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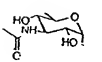
and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in the presence of at least one first glycosyltransferase wherein the at least glycosylated compound is produced.

29. A method comprising incubating at least one glycosylated compound produced by the method of claim 29 that is capable of being glycosylated with and at least one second nucleotide diphosphosugar in the presence of at least one second glycosyltransferase to produce at least one twice-glycosylated compound having at least a first and a second glycosyl attachment.

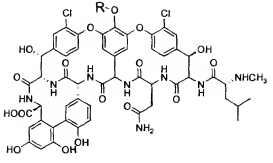
30. A method according to claim 28, further wherein the moiety capable of being glycosylated is selected from the group consisting of natural and synthetic metabolites, pyran rings, furan rings, enediynes, anthracyclines, angucyclines, aureolic acids, orthosomycins, macrolides, aminoglycosides, non-ribosomal peptides, polyenes, steroids, lipids, indolocarbazoles, bleomycins, amicetins, benzoisochromanequinones coumarins, polyketides, pluramycins, aminoglycosides, oligosaccharides, peptides, proteins, hybrids consisting of one or more these components, analogs and bioactive aglycons thereof.

31. A method of claim 28, further wherein the moiety capable of being glycosylated is selected from the group consisting of vancomycin, teicoplannin, analogs, hybrids, and active aglycons thereof.

32. A method according to claim 28, further comprising subjecting at least one glycosylated compound to repeated cycles of incubation with at least one nucleotide diphosphosugar in the presence of at least one glycosyltransferase until a population of multiply-glycosylated compounds of the desired type and number of compounds is achieved.

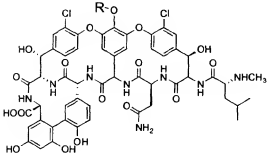
33. A novel compound produced by the method of any of claims 27, 29 or 32.

34. A vancomycin derivative designated by the formula:



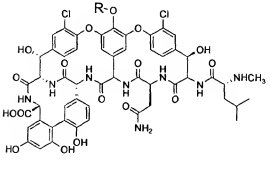
wherein R is  .

35. A vancomycin derivative designated by the formula:



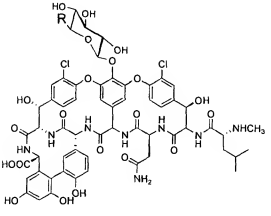
wherein R is  .

36. A vancomycin derivative designated by the formula



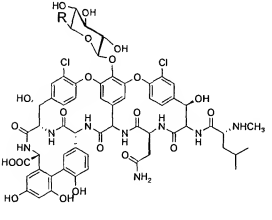
wherein R is  .

37. A vancomycin derivative designated by the formula



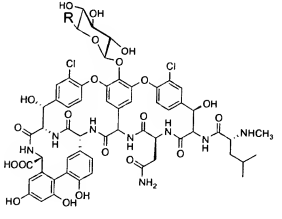
wherein R is .

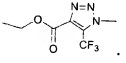
38. A vancomycin derivative designated by the formula



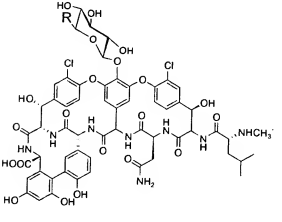
wherein R is .

39. A vancomycin derivative designated by the formula



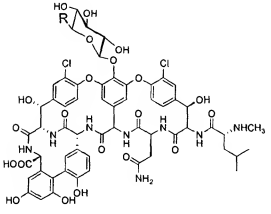
wherein R is  .

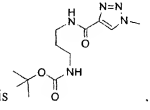
40. A vancomycin derivative designated by the formula



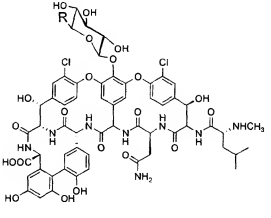
wherein R is  .

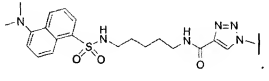
41. A vancomycin derivative designated by the formula



wherein R is  .

42. A vancomycin derivative designated by the formula



wherein R is  .

43. A method of reducing or preventing bacterial infection in a patient, comprising the step of administering a pharmaceutically effective amount of a composition according

to any one of the claims 35-43 to said patient.